Aug. 4, 1931. J. H. ABRAMSON ET AL 1,817,223

METAL PUNCH

Filed Jan. 25, 1928

Fig. 1.

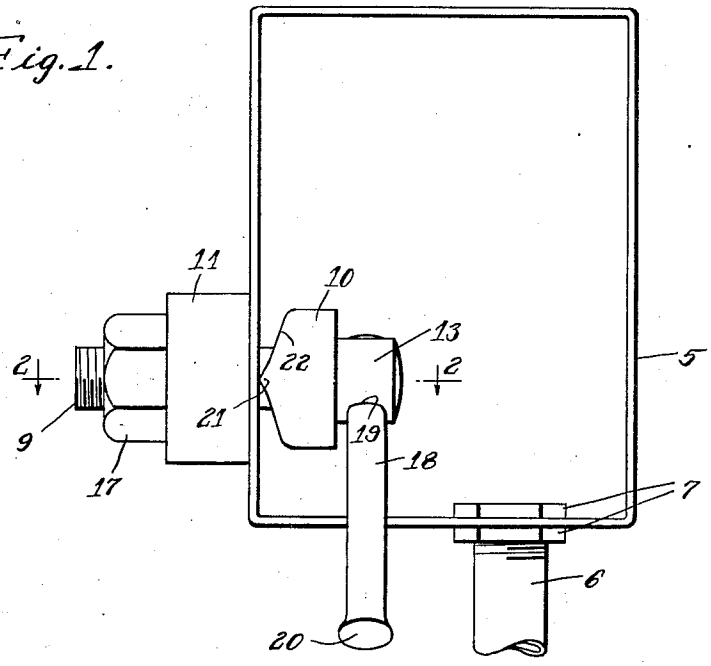


Fig. 2

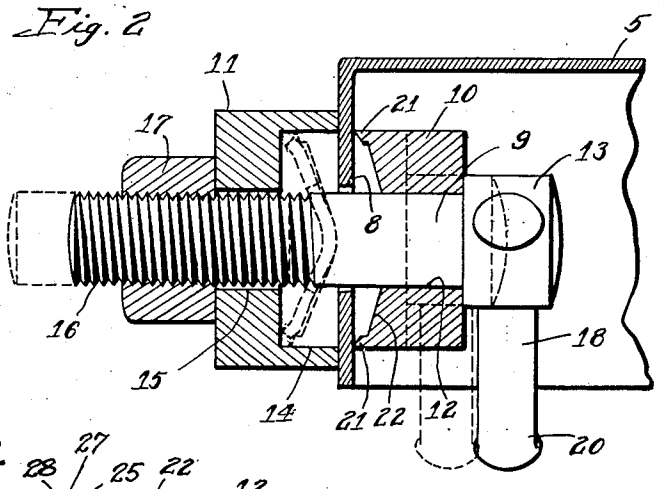
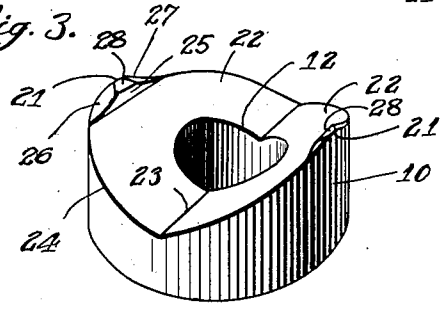


Fig. 3.



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METAL PUNCH

Application filed January 25, 1928. Serial No. 249,388.

This invention relates to metal punches generally, although certain features of the present tool have special reference to the adaptation thereof for use by electricians in the enlargement of knockout holes in outlet and switch boxes.

The standard outlet box, as is generally known, is provided with knock-outs of one size, usually seven-eighths of an inch, and whenever it was desired to connect up a larger sized conduit with the box, the electrician was confronted with the problem of enlarging a knock-out hole to the desired size by one makeshift method or another. For example, where slight enlargement was desired, the hole had to be reamed out to the desired size, which in itself was a rather tedious operation, but if greater enlargement was desired, it was customary to scribe a circle of the desired size, drill holes within the circle at several points, and then saw out the slug by sawing from one hole to the next, and so on around the circle. The job done in these ways was manifestly laborious and time consuming.

The tool of our invention is designed to be inserted in the standard knock-out hole and, by a simple, easy and speedy wrench operation, to punch out a slug tolerably concentric with the original hole to provide a larger hole of the right size to take a larger sized conduit. The tool comprises essentially only three parts, namely, a bolt arranged to be passed through the knock-out hole and to receive a nut outside the box, a cylindrical punch placed on the bolt preferably within the box next to the head of the bolt, and a cylindrical die placed on the bolt preferably outside the box next to the nut threaded on the bolt. When the tool is used with the punch disposed inside the box, it is possible to punch out a hole in the side wall immediately alongside the back wall or an adjoining side wall. A special feature consists in the provision of a rod on the head of the bolt arranged to serve as a handle in the application of the tool to the box and thereafter, by coming into engagement with some nearby part of the box to serve to hold the bolt against turning, so that the operation of the tool is reduced simply to the use of a wrench applied to the nut on the bolt. Where the aforesaid handle cannot be brought into engagement with some part of the box, it is intended that a piece of conduit be slipped over the same for holding.

An especially noteworthy feature of the tool of our invention consists in the provision of a punch of a special form, the use of which makes it practically as easy to punch out a slug of a larger diameter as one of a smaller diameter and to make a clean cut in either case. For this purpose we provide a pair of diametrically opposed protruding spurs or teeth on the punch arranged to pierce through the wall of the box at the commencement of the punching operation and portions rearwardly inclined relative to said spurs to provide shear edges arranged thereafter to cooperate with the die as the punch is drawn into the latter to cut out a perfectly round slug. Due to the special form of the punch, a decided advantage is derived in that the slug punched out is bent in the operation of the tool to a V-form, thus making the same smaller than the bore of the die so that it is comparatively easy to remove the same.

The invention is described in greater detail in the following specification wherein reference is made to the accompanying drawings, in which:

Figure 1 is a view of an ordinary outlet box, showing the tool of our invention mounted in one of the knock-out holes preparatory to the punching out of a slug to enlarge the same;

Fig. 2 is an enlarged horizontal section taken on the line 2—2 of Fig. 1, and

Fig. 3 is an isolated perspective of the novel form of punch which we prefer to employ in our tool.

The same reference numerals are applied to corresponding parts in the three views.

The box shown at 5 may be regarded as any standard outlet box to which several conduits, such as that shown at 6, may be connected and anchored, as by means of nuts 7. The knock-out holes provided in a standard box, one of which is shown at 8 in Fig. 2, are always one certain size to take one-half inch conduit, as is generally known, these

holes being of seven-eighths of an inch diameter. The tool of our invention is provided for the purpose of punching out slugs of different diameters as may be required for different sized conduits wherever it is necessary to connect up a larger sized conduit with the outlet box, or switch box, as the case may be. Accordingly, we provide a tool comprising a bolt 9 of a size to be insertable freely through a knock-out hole and provide a punch 10 and die 11 for each of the various standard sized conduits which an electrician is ever apt to have to deal with. In other words, the tool comprises essentially only three parts, the bolt, the punch, and the die, a complete set of punches with dies to match being provided for the different sizes of conduits and the bolt being arranged for use interchangeably with any punch and its companion die. The punch 10, as clearly appears in Fig. 3, is of cylindrical form with a central hole 12 for the reception of the bolt 9, the punch being arranged to be placed on the bolt next to the head 13 thereof and preferably within the box, for the reason that that makes it possible to work up close to the back wall or an adjoining side wall. The punch is arranged to fit slidably in the cylindrical bore 14 of the die 11 disposed outside the box and having a central hole 15 to take the threaded end 16 of the bolt 9. The nut 17 threading on the bolt abuts against the back of the die and is arranged in the tightening thereof to draw the punch into the die. The bolt is held against turning by a rod 18 passed through a transverse hole 19 in the head 13 of the bolt, said rod being arranged to bear against an adjoining side wall of the box, as shown in Fig. 1, or possibly against the back wall thereof, depending on where the tool is being used. The rod is slidable in its hole and has the ends thereof upset as at 20 just enough to keep it from dropping out. If it should happen that the tool is being used in such a place where the rod will not reach some part of the box in the manner just described, then it is contemplated that the electrician may slip the end of a piece of conduit over the rod to hold the same. The though is to reduce the operation of the tool merely to the use of a wrench applied to the nut 17. The nut is of a size such that the wrench which every electrician carries in his kit will fit the same. No extra tools are therefore necessitated. Although an ordinary nut is shown at 17, we contemplate the use of one having a ratchet built therein to make it handier to operate the tool in a relatively confined space. The improvement of the tool in this way we regard as not amounting to invention, and for that reason the additional feature has not been shown.

The punch 10 is of a special form, as stated above, to facilitate the punching out of the slug with a clean cut. In fact, the form of the punch makes it practically as easy to punch out a large slug as a small one. The working face of the punch is provided with diametrically opposed protruding sharpened spurs or teeth 21 arranged to bite into and pierce through the wall first when the punch is drawn axially into the die. The spurs are provided with a vertically inclined wall 25 on the face 22 of the punch 10 to provide flattened side portions 26 and 27 on either side of the point 21, an inclined face 28 extending between the wall 25, the point 21 and the flattened side portions 26 and 27. It will be observed that the shearing edge 24 continues unbroken from the angle at 23 to the point 21 of each spur. The shearing edge is, however, given a slightly greater pitch along the spurs to decrease the shearing rate until the spurs have passed through the metal. This construction permits shearing of the metal to proceed slowly until the spurs have passed through before the face 22 of the punch comes into contact therewith and results in a spur of substantial thickness of metal. Receding from the spurs 21 are rearwardly inclined portions 22 converging in the form of a V diametrically of the face of the punch, as indicated at 23. The edges 24 of these portions of the face of the punch serve as shearing edges which, in cooperation with the die, serve to cut the wall of the box to remove a slug therefrom of truly circular form; an exact counterpart of the bore 14 of the die 11. It is due to this shearing action that the tool works so easily and that there is hardly any difference in the operation of the tool in punching out different sized slugs, inasmuch as the angle of inclination of the portions 22 of the punch face is proportioned according to the diameter of the punch; the included angle at 23 between the portions 22 being greater for smaller sized punches than for those of larger size. To state it differently: The face of a smaller punch is so conformed that the stroke of the punch from the start to the finish of the punching operation is shorter than in the case of a larger punch. A distinct advantage derived in the use of a punch of the form just described is that the slug punched out is bent into V-form, shown in dotted lines in Fig. 2, because of the fact that the cutting out of the slug commences at diametrically opposite points and progresses circle-wise in both directions to the finish points, and as the wall is penetrated, the portions of the slug conform to the face of the punch, with the result that the slug eventually cut out is sufficiently smaller across one dimension thereof that it comes out of the die readily, or at least a screw driver bit, or other pronged tool, may be inserted alongside the same to dislodge it. The contraction in size of the knockout hole 8 caused by the bending of the slug is not sufficient to make the

ug bind on the bolt, the bolt being provided
nall enough with that in mind.

It is believed the foregoing description
nveys a clear understanding of our inven-
on and of its various objects and advan-
ges. While we have referred to the advan-
ges in the use of the tool by electricians for
e punching of holes in outlet boxes and
witch boxes, it should be evident that the
ol might be employed to good advantage
r other purposes. No limitation should
erefore be regarded as imposed on the ap-
lication of our invention. Furthermore, all
odifications and adaptations are intended
be covered in the appended claims.

We claim:

1. A metal punch comprising a punch ele-
ent, and a die element having a bore to re-
ive the punch element, the working face of
e punch element having a projecting spur
t the peripheral edge thereof arranged to
resent a sharp point and flat sides to the
ork to pierce the work first as the punch
lement enters the die element, and said
unch element having substantially the rest
f the working face thereof inclined with re-
pect to a normal to the direction of its move-
ent to provide, with said spurs, peripheral
earing edges to exert a shearing action fol-
wing the piercing of the work by said spur.

2. A metal punch comprising a cylindrical
unch element, and a die element having a
ylindrical bore for slidably receiving the
unch element, the working face of the punch
lement being inclined rearwardly from two
ubstantially diametrically opposed points
hereof in converging relation to provide
eripheral shearing edges when the punch
lement is drawn axially into the die element,
projecting work-piercing and shearing spur
t at least one of said diametrically opposed
oints, said spur having a sharp point, flat-
ened side portions providing a portion of
aid peripheral shearing edges, and an in-
lined face joining said point and said die
ortions.

In witness whereof we hereto affix our sig-
atures.

JOHN HERBERT ABRAMSON.
EDWIN C. SWANSON.